Complete Summary

GUIDELINE TITLE

Education for a partnership in asthma care: Expert panel report 3: guidelines for the diagnosis and management of asthma.

BIBLIOGRAPHIC SOURCE(S)

Education for a partnership in asthma care. In: National Asthma Education and Prevention Program (NAEPP). Expert panel report 3: guidelines for the diagnosis and management of asthma. Bethesda (MD): National Heart, Lung, and Blood Institute; 2007 Aug. p. 93-164. [239 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: National Asthma Education and Prevention Program Expert Panel Report: guidelines for the diagnosis and management of asthma update on selected topics-2002. J Allergy Clin Immunol 2002 Nov;110(5 pt 2):S141-219.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Asthma

GUIDELINE CATEGORY

Counseling
Diagnosis

Evaluation
Management
Risk Assessment

CLINICAL SPECIALTY

Allergy and Immunology
Emergency Medicine
Family Practice
Internal Medicine
Pediatrics
Pharmacology
Preventive Medicine
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Health Plans
Nurses
Physician Assistants
Physicians
Respiratory Care Practitioners

GUIDELINE OBJECTIVE(S)

- To present recommendations for the diagnosis and management of asthma that will help clinicians and patients make appropriate decisions about asthma care
- To develop clinical practice tools and educational materials for patients and the public
- To revise the National Asthma Education and Prevention Program Expert Panel Report-2 Stepwise Approach for Managing Asthma in order to incorporate findings from the review of the scientific evidence
- To present recommendations on asthma self-management at multiple points of care, tools for asthma self-management, and provider education

TARGET POPULATION

Infants, children, adolescents, and adults with asthma

INTERVENTIONS AND PRACTICES CONSIDERED

1. Asthma self-management education
    - Integration of self-management into all aspects of asthma care and at multiple points of care
    - Provision of all patients with a written asthma action plan that includes daily management and how to recognize and handle worsening asthma
    - Regular review of the status of the patient's asthma control
    - Developing an active partnership with the patient and family

- Encouraging patient adherence
- Tailoring self-management to needs of each patient
- Encouraging development and evaluation of community-based interventions

2. Provider education
    - Implementing multidimensional, interactive clinician education
    - Participation in programs to enhance skills in communicating with patients
    - Encouraging development and use of clinical pathways for management of acute asthma
    - Developing, implementing, and evaluating system-based interventions to support clinical decision-making and quality care

MAJOR OUTCOMES CONSIDERED

- Improvement in asthma outcome
- Morbidity related to asthma
- Number of urgent care visits and hospitalizations
- Asthma-related health care costs
- Functional ability
- Quality of life

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

In October 2004, the Expert Panel assembled for its first meeting. Using the Expert Panel Report (EPR)—2 1997 and EPR—Update 2002 as the framework, the Expert Panel organized the literature searches and subsequent report around the four essential components of asthma care, namely: (1) assessment and monitoring, (2) patient education, (3) control of factors contributing to asthma severity, and (4) pharmacologic treatment. Subtopics were developed for each of these four broad categories.

Inclusion/Exclusion Criteria

The literature review was conducted in three cycles over an 18-month period (September 2004 to March 2006). Search strategies for the literature review initially were designed to cast a wide net but later were refined by using publication type limits and additional terms to produce results that more closely matched the framework of topics and subtopics selected by the Expert Panel. The searches included human studies with abstracts that were published in English in peer-reviewed medical journals in the MEDLINE database. Two timeframes were used for the searches, dependent on topic: January 1, 2001, through March 15, 2006, for pharmacotherapy (medications), peak flow monitoring, and written action plans, because these topics were recently reviewed in the EPR—Update

2002; and January 1, 1997, through March 15, 2006, for all other topics, because these topics were last reviewed in the EPR—2 1997.

Search Strategies

Panel members identified, with input from a librarian, key text words for each of the four components of care. A separate search strategy was developed for each of the four components and various key subtopics when deemed appropriate. The key text words and Medical Subject Headings (MeSH) terms that were used to develop each search string are found in an appendix posted on the National Heart, Lung, and Blood Institute (NHLBI) Web site.

Literature Review Process

The systematic review covered a wide range of topics. Although the overarching framework for the review was based on the four essential components of asthma care, multiple subtopics were associated with each component. To organize a review of such an expanse, the Panel was divided into 10 committees, with about 4 to 7 reviewers in each (all reviewers were assigned to 2 or more committees). Within each committee, teams of two ("topic teams") were assigned as leads to cover specific topics. A system of independent review and vote by each of the two team reviewers was used at each step of the literature review process to identify studies to include in the guidelines update. The initial step in the literature review process was to screen titles from the searches for relevancy in updating content of the guidelines, followed by reviews of abstracts of the relevant titles to identify those studies meriting full-text review based on relevance to the guidelines and study quality.

The combined number of titles screened from cycles 1, 2, and 3 was 15,444. The number of abstracts and articles reviewed for all three cycles was 4,747. Of these, 2,863 were voted to the abstract Keep list following the abstract-review step. A database of these abstracts is posted on the NHLBI Web site. Of these abstracts, 2,122 were advanced for full-text review, which resulted in 1,654 articles serving as a bibliography of references used to update the guidelines, available on the NHLBI Web site. Articles were selected from this bibliography for evidence tables and/or citation in the text. In addition, articles reporting new and particularly relevant findings and published after March 2006 were identified by Panel members during the writing period (March 2006–December 2006) and by comments received from the public review in February 2007.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

The system* used to describe the level of evidence is as follows:

Evidence Category A: Randomized controlled trials (RCTs), rich body of data.
Evidence is from end points of well-designed RCTs that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants.

Evidence Category B: RCTs, limited body of data.
Evidence is from end points of intervention studies that include only a limited number of patients, post hoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, category B pertains when few randomized trials exist; they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent.

Evidence Category C: Nonrandomized trials and observational studies.
Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies.

Evidence Category D: Panel consensus judgment.
This category is used only in cases where the provision of some guidance was deemed valuable, but the clinical literature addressing the subject was insufficient to justify placement in one of the other categories. The Panel consensus is based on clinical experience or knowledge that does not meet the criteria for categories A through C.

*Source: Jadad AR, Moher M, Browman GP, Booker L, Sigouin C, Fuentes M, Stevens R. Systematic reviews and meta-analyses on treatment of asthma: critical evaluation. *BMJ* 2000;320(7234):537-40.

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Preparation of Evidence Tables

Evidence tables were prepared for selected topics. It was not feasible to generate evidence tables for every topic in the guidelines. Furthermore, many topics did not have a sufficient body of evidence or a sufficient number of high-quality studies to warrant the preparation of a table. The Panel decided to prepare evidence tables on those topics for which an evidence table would be particularly useful to assess the weight of the evidence—e.g., topics with numerous articles, conflicting evidence, or which addressed questions raised frequently by clinicians. Summary findings on topics without evidence tables, however, also are included in the updated guidelines text. Evidence tables were prepared with the assistance of a methodologist who served as a consultant to the Expert Panel. Within their respective committees, Expert Panel members selected the topics and articles for

evidence tables. The evidence tables included all articles that received a "yes" vote from both the primary and secondary reviewer during the systematic literature review process. The methodologist abstracted the articles to the tables, using a template developed by the Expert Panel. The Expert Panel subsequently reviewed and approved the final evidence tables. A total of 20 tables, comprising 316 articles are included in the current update. Evidence tables are posted on the National Heart, Lung, and Blood Institute (NHLBI) Web site.

Ranking the Evidence

The Expert Panel agreed to specify the level of evidence used to justify the recommendations being made. Panel members only included ranking of evidence for recommendations they made based on the scientific literature in the current evidence review. They did not assign evidence rankings to recommendations pulled through from the Expert Panel Report (EPR)—2 1997 on topics that are still important to the diagnosis and management of asthma but for which there was little new published literature. These "pull through" recommendations are designated by EPR—2 1997 in parentheses following the first mention of the recommendation. For recommendations that have been either revised or further substantiated on the basis of the evidence review conducted for the EPR—3: Full Report 2007, the level of evidence is indicated in the text in parentheses following first mention of the recommendation. Refer to the "Rating Scheme for the Strength of the Evidence" for the system used to describe the level of evidence.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The steps used to develop this report include: (1) completing a comprehensive search of the literature; (2) conducting an in-depth review of relevant abstracts and articles; (3) preparing evidence tables to assess the weight of current evidence with respect to past recommendations and new and unresolved issues; (4) conducting thoughtful discussion and interpretation of findings; (5) ranking strength of evidence underlying the current recommendations that are made; (6) updating text, tables, figures, and references of the existing guidelines with new findings from the evidence review; (7) circulating a draft of the updated guidelines through several layers of external review, as well as posting it on the National Heart, Lung, and Blood Institute (NHLBI) Web site for review and comment by the public and the National Asthma Education and Prevention Program Coordinating Committee (NAEPP CC), and (8) preparing a final-report based on consideration of comments raised in the review cycle.

Panel Discussion

The first opportunity for discussion of findings occurred within the "topic teams." Teams then presented a summary of their findings during a conference call to all members of their respective committee. A full discussion ensued on each topic, and the committee arrived at a consensus position. Teams then presented their findings and the committee position to the full Expert Panel at an in-person

meeting, thereby engaging all Panel members in critical analysis of the evidence and interpretation of the data. A series of conference calls for each of the 10 committees as well as four in-person Expert Panel meetings (held in October 2004, April 2005, December 2005, and May 2006) were scheduled to facilitate discussion of findings and to dovetail with the three cycles of literature review that occurred over the 18-month period. Potential conflicts of interest were disclosed at the initial meeting.

Report Preparation

Development of the Expert Panel Report (EPR)—3: Full Report 2007 was an iterative process of interpreting the evidence, drafting summary statements, and reviewing comments from the various external reviews before completing the final report. In the summer and fall of 2005, the various topic teams, through conference calls and subsequent electronic mail, began drafting their assigned sections of the report. Members of the respective committees reviewed and revised team drafts, also by using conference calls and electronic mail. During the calls, votes were taken to ensure agreement with final conclusions and recommendations.

During the December 2005 meeting, Panel members reviewed and discussed all committee drafts. During the May 2006 meeting, the Panel conducted a thorough review and discussion of the report and reached consensus on the recommendations. For controversial topics, votes were taken to ensure that each individual's opinion was considered.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

In addition to specifying the level of evidence supporting a recommendation, the Expert Panel agreed to indicate the strength of the recommendation. When a certain clinical practice "is recommended," this indicates a strong recommendation by the panel. When a certain clinical practice "should, or may, be considered," this indicates that the recommendation is less strong.

This distinction is an effort to address nuances of using evidence ranking systems. For example, a recommendation for which clinical randomized controlled trial data are not available (e.g., conducting a medical history for symptoms suggestive of asthma) may still be strongly supported by the Panel. Furthermore, the range of evidence that qualifies a definition of "B" or "C" is wide, and the Expert Panel considered this range and the potential implications of a recommendation as they decided how strongly the recommendation should be presented.

COST ANALYSIS

Cost-effectiveness analyses provide evidence of the financial impact of interventions as well as their clinical benefits. The analyses relate costs to a measure of clinical effectiveness of the intervention. The cost-effectiveness ratio is the ratio of the difference in costs between two alternatives to the difference in effectiveness between the same two alternatives. When an intervention that has a certain cost improves a significant clinical outcome and total costs are decreased, the intervention is considered cost-effective. For example, if self-management education improves overall control of asthma, with fewer days of symptoms,

fewer emergency department visits, and fewer hospitalizations, then the intervention may result in lower overall direct medical costs. If these educated patients also have fewer missed work or school days, then indirect costs are reduced as well.

Taken together, the analyses of costs in both randomized and observation trials demonstrate the cost-effectiveness of education in those asthma self-management programs that improve patients' skills and decrease health care utilization. See the original guideline document for a discussion of cost-effectiveness studies. Also see Evidence Table 6, Cost-Effectiveness of Asthma Self-Management Education (see the "Availability of Companion Documents" field).

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

In July, using conference calls and electronic mail, the Panel completed a draft of the Expert Panel Report (EPR)—3: Full Report 2007 for submission in July/August to a panel of expert consultants for their review and comments. In response to their comments, a revised draft of the EPR—3: Full Report 2007 was developed and circulated in November to the National Asthma Education and Prevention Program (NAEPP) Guidelines Implementation Panel (GIP) for their comment. This draft was also posted on the National Heart Lung and Blood Institute (NHLBI) Web site for public comment in February 2007. The Expert Panel considered 721 comments from 140 reviewers. Edits were made to the documents, as appropriate, before the full EPR—3: Full Report 2007 was finalized and published.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions of the levels of the evidence (A, B, C, D) and strength of recommendations ("is recommended" and "should or may, be considered") are presented at the end of the "Major Recommendations" field.

Note from the National Asthma Education and Prevention Program (NAEPP): Panel members only included ranking of evidence for recommendations they made based on the scientific literature in the current evidence review. They did not assign evidence rankings to recommendations pulled through from the Expert Panel Report (EPR)—2 1997 on topics that are still important to the diagnosis and management of asthma but for which there was little new published literature. These "pull through" recommendations are designated by EPR—2 1997 in parentheses following the first mention of the recommendation.

Note from the NAEPP and the National Guideline Clearinghouse (NGC): The Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma have been divided into individual summaries covering assessment,

education, medications, and management. In addition to the current summary, the following are available:

- Measures of asthma assessment and monitoring.
- Control of environmental factors and comorbid conditions that affect asthma.
- Medications.
- Managing asthma long term in children 0-4 years of age and 5-11 years of age.
- Managing asthma long term in youths >12 years of age and adults.
- Managing asthma long term—special situations
- Managing exacerbations of asthma.

Key Points: Education for a Partnership in Asthma Care

- Asthma self-management education is essential to provide patients with the skills necessary to control asthma and improve outcomes **(Evidence A)**.
- Asthma self-management education should be integrated into all aspects of asthma care, and it requires repetition and reinforcement. It should:
    - Begin at the time of diagnosis and continue through followup care **(Evidence B)**.
    - Involve all members of the health care team **(Evidence B)**.
    - Introduce the key educational messages by the principal clinician, and negotiate agreements about the goals of treatment, specific medications, and the actions patients will take to reach the agreed-upon goals to control asthma **(Evidence B)**.
    - Reinforce and expand key messages (e.g., the patient's level of asthma control, inhaler techniques, self-monitoring, and use of a written asthma action plan) by all members of the health care team **(Evidence B)**.
    - Occur at all points of care where health professionals interact with patients who have asthma, including clinics, medical offices, emergency departments (EDs) and hospitals, pharmacies, homes, and community sites (e.g., schools, community centers) **(Evidence A or B**, depending on point of care).
        - Strong evidence supports self-management education in the clinic setting **(Evidence A)**.
        - Observational studies and limited clinical trials support consideration of focused, targeted patient education in the ED setting (e.g., teaching inhaler technique and providing an ED asthma discharge plan with instructions for discharge medications and for increasing medication or seeking medical care if asthma should worsen). Studies demonstrate the benefits of education in the hospital setting **(Evidence B)**.
        - Studies of pharmacy-based education directed toward understanding medications and teaching inhaler and self-monitoring skills show the potential of using community pharmacies as a point of care for self-management education. Studies report difficulties in implementation, but they also demonstrate benefits in improving asthma self-management skills and asthma outcomes **(Evidence B)**.
        - Studies demonstrate the benefits of programs provided in the patient's home for multifaceted allergen control, although

further evaluation of cost-effectiveness and feasibility for widespread implementation will be helpful **(Evidence A)**.
    - Some, but not all, school-based programs have demonstrated success in reducing symptoms and urgent health care use and in improving school attendance and performance. Proven school-based programs should be considered for implementation because of their potential to reach large numbers of children who have asthma and provide an "asthma-friendly" learning environment for students who have asthma **(Evidence B)**.
    - Emerging evidence suggests the potential for using computer and Internet programs incorporated into asthma care **(Evidence B)**.
- Provide all patients with a written asthma action plan that includes two aspects: (1) daily management and (2) how to recognize and handle worsening asthma. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma **(Evidence B)**.
- Regular review, by an informed clinician, of the status of the patient's asthma control is an essential part of asthma self-management education **(Evidence B)**. Teach and reinforce at *every* opportunity **(EPR - 2 1997)**:
    - Basic facts about asthma
    - What defines well-controlled asthma and the patient's current level of control
    - Roles of medications
    - Skills: e.g., inhaler technique, use of a valved holding chamber (VHC) or spacer, and self-monitoring
    - When and how to handle signs and symptoms of worsening asthma
    - When and where to seek care
    - Environmental exposure control measures
- Develop an active partnership with the patient and family by **(EPR - 2 1997)**:
    - Establishing open communications.
    - Identifying and addressing patient and family concerns about asthma and asthma treatment.
    - Identifying patient/parent/child treatment preferences regarding treatment and barriers to its implementation.
    - Developing treatment goals together with patient and family.
    - Encouraging active self-assessment and self-management of asthma.
- Encourage adherence by:
    - Choosing a treatment regimen that achieves outcomes and addresses preferences that are important to the patient/caregiver **(Evidence B)**.
    - Reviewing the success of the treatment plan with the patient/caregiver at each visit and making adjustments as needed **(Evidence B)**.
- Tailor the asthma self-management teaching approach to the needs of each patient. Maintain sensitivity to cultural beliefs and ethnocultural practices **(Evidence C)**.
- Encourage development and evaluation of community-based interventions that provide opportunities to reach a wide population of patients and their families, particularly those patients at high risk of asthma morbidity and mortality **(Evidence D)**.
- Asthma self-management education that is provided by trained health professionals should be considered for policies and reimbursements as an

integral part of effective asthma care; the education improves patient outcomes **(Evidence A)** and can be cost-effective in improving patient outcomes **(Evidence B)**.

Key Points: Provider Education

- Implement multidimensional, interactive clinician education in asthma care including, for example, case discussions involving active participation by the learners **(Evidence B)**.
- Consider participation in programs to enhance skills in communicating with patients **(Evidence B)**.
- Encourage development and use of clinical pathways for management of acute asthma **(Evidence B)**.
- Develop, implement, and evaluate system-based interventions to support clinical decision making and to support quality care for asthma **(Evidence B)**.

Key Differences from 1997 and 2002 Expert Panel Reports

Patient Education

- Emphasis on the many potential points of care and sites available in which to provide asthma education, including review of new evidence regarding the efficacy of asthma self management education outside the usual office setting.
- Greater emphasis on the two aspects of the written asthma action plan—(1) daily management, and (2) how to recognize and handle worsening asthma. Use of the terminology "written asthma action plan" encompasses both aspects. This change addresses confusion over the previous guidelines' use of different terms. One term is now used for the written asthma action plan, although in some studies cited, investigators may have used a variation of this term.
- New sections on the impact of cultural and ethnic factors and health literacy that affect delivery of asthma self-management education.

Provider Education

- New section with review of system-based interventions to improve the quality of asthma care, to support clinical decision making, and to enhance clinical information systems
- Review of tested programs that use effective strategies to provide clinician education in asthma care, e.g., multidimensional approaches, interactive formats, and practice-based case studies

Asthma Self-Management Education at Multiple Points of Care

The Expert Panel recommends that patients be educated at multiple points of care where health professionals and health educators may interact with patients who have asthma (**Evidence A or B**, depending on point of care).

Clinic/Office Based Education

Adults—Teach Asthma Self-Management Skills To Promote Asthma Control

The Expert Panel recommends that:

- Clinicians provide to patients asthma self-management education that includes the following essential items: asthma information and training in asthma management skills **(Evidence A)**, self-monitoring (either symptom– or peak flow–based) **(Evidence A)**, written asthma action plan **(Evidence B),** and regular assessment by a consistent clinician **(Evidence B)**.
- Clinicians involve patients in decisions about the type of self-monitoring of asthma control that they will do **(Evidence B)**
- Clinicians provide all patients with a written asthma action plan that includes instructions for (1) daily management, and (2) recognizing and handling worsening asthma, including self-adjustment of medications in response to acute symptoms or changes in peak expiratory flow (PEF) measures. Written asthma action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma **(Evidence B)**.
- Clinicians involve adult patients in the treatment decisionmaking within the context of a therapeutic partnership **(Evidence B)**.
- Health professionals and others trained in asthma self-management education be used to implement and teach asthma self-management programs **(Evidence B)**.
- Because poor attendance at multiple sessions may be a problem in some populations, consider introducing key messages and essential skills of self management in the first session and adjusting subsequent sessions to the needs of the patients in the groups **(Evidence D)**. Research comparing lengthy versus condensed or shorter sessions is encouraged.

Children—Teach Asthma Self-Management Skills To Promote Asthma Control

The Expert Panel recommends that asthma self-management education be incorporated into routine care for children who have asthma **(Evidence A)**.

Emergency Department/Hospital-Based Education

Adults

The Expert Panel recommends that:

- At the time of discharge from the ED, clinicians offer brief and focused asthma education **(Evidence D)** and provide patients with an ED asthma discharge plan with instructions to the patients and family for how to use it **(Evidence B)**.
- Before patients are discharged home, assess inhaler techniques for all prescribed medications and reinforce correct technique **(Evidence B)**.
- At the time of discharge from the ED, patients be referred for followup asthma care appointment (either primary care provider [PCP] or asthma specialist) within 1 to 4 weeks**(Evidence B)**. If appropriate, consider referral to an asthma self-management education program **(Evidence B)**.
- Before patients are discharged from a hospitalization for asthma exacerbations, give them asthma self-management education **(Evidence B)**.

Children

The Expert Panel recommends that asthma education programs that have been shown to be effective be delivered to children during or following discharge from the ED or the hospital **(Evidence B)**. More research is needed to understand how to make education maximally effective at this point of care.

The Expert Panel recommends that:

- At the time of discharge from the ED, clinicians offer brief and focused asthma education **(Evidence D)** and provide patients with an ED asthma discharge plan with instructions to the patients and family for how to use it **(Evidence B)**.
- Before patients are discharged home, assess inhaler techniques for all prescribed medications and reinforce correct technique **(Evidence B)**.
- At the time of discharge from the ED, patients be referred for followup asthma care appointment (either PCP or asthma specialist) within 1 to 4 weeks **(Evidence B)**. If appropriate, consider referral to an asthma self-management education program **(Evidence B)**.
- Before patients are discharged from a hospitalization for asthma exacerbations, give them asthma self-management education **(Evidence B)**.

Educational Interventions by Pharmacists

The Expert Panel recommends that use of interventions provided by pharmacists be considered; such programs are feasible, and they merit further studies of effectiveness **(Evidence B)**.

Educational Interventions in School Settings

The Expert Panel recommends that implementation of school-based asthma education programs proven to be effective be considered to provide to as many children who have asthma as possible the opportunity to learn asthma self-management skills and to help provide an "asthma-friendly" learning environment for students who have asthma **(Evidence B)**.

Community-Based Interventions

Asthma Education

It is the opinion of the Expert Panel that, although studies of community-based asthma education do not demonstrate benefits in health status, they do show that asthma education programs delivered by trained community residents are feasible, can result in behavior change and improved quality of life, and deserve further research **(Evidence C)**.

Home-Based Interventions

Home-Based Asthma Education for Caregivers

The Expert Panel recommends that asthma education delivered in the homes of caregivers of young children be considered and that this area needs more research **(Evidence C)**.

Home-Based Allergen-Control Interventions

The Expert Panel recommends that multifaceted allergen education and control interventions delivered in the home setting and that have been shown to be effective in reducing exposures to cockroach, rodent, and dust-mite allergen and associated asthma morbidity be considered for asthma patients sensitive to those allergens **(Evidence A)**. Further research to evaluate the cost-effectiveness and the feasibility of widespread implementation of those programs will be helpful.

Other Opportunities for Asthma Education

Education for Children Using Computer-Based Technology

The Expert Panel recommends that computer-based programs that are incorporated into asthma care be considered for adolescents and children **(Evidence B)**.

Education on Tobacco Avoidance for Women Who Are Pregnant and Members of Households With Infants and Young Children

The Expert Panel recommends that all patients who have asthma and women who are pregnant be advised not to smoke and not to be exposed to environmental tobacco smoke (ETS) **(Evidence C)**. Query patients about their smoking status, and consider specifically referring to smoking cessation programs adults who smoke and have young children who have asthma in the household **(Evidence B)**.

Case Management for High-Risk Patients

The Expert Panel recommends that case or care management by trained health professionals be considered for patients who have poorly controlled asthma and have recurrent visits to the ED or hospital **(Evidence B)**.

Cost-Effectiveness

The Expert Panel recommends that asthma self-management education that is provided by trained health professionals be considered for policies and reimbursements as an integral part of effective asthma care; the education improves patient outcomes **(Evidence A)** and can be cost-effective **(Evidence B)**.

Tools for Asthma Self-Management

Role of the Written Asthma Action Plans for Patients who Have Asthma

The Expert Panel recommends that clinicians provide to all patients who have asthma a written asthma action plan that includes instructions for (1) daily

management and (2) recognizing and handling worsening asthma, including adjustment of dose of medications. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma **(Evidence B)**. Written asthma action plans may be based on PEF measurements or symptoms or both, depending on the preference of the patient and clinician **(Evidence B)**. A peak-flow-based plan may be particularly useful for patients who have difficulty perceiving signs of worsening asthma **(Evidence D)**.

Role of Peak Flow Monitoring

The Expert Panel recommends that:

- Written asthma action plans can be based on either symptoms or peak flow measurements **(Evidence B)**.
- Long-term daily peak flow monitoring be considered for patients who have moderate or severe persistent asthma **(Evidence B)**, poor perception of airflow obstruction or worsening asthma, unexplained response to environmental or occupational exposures, and others at the discretion of the clinician and the patient **(EPR—2 1997)**.

Establish and Maintain a Partnership

The Expert Panel recommends that a partnership between patient and clinician be established to promote effective asthma management **(Evidence A)**.

The Expert Panel recommends that when nurses, pharmacists, respiratory therapists, and other health care professionals are available to provide and support patient self-management education, a team approach through multiple points of care should be used (National Heart, Lung, and Blood Institute [NHLBI], "Nurses," 1995; NHLBI, "The role of the pharmacist," 1995).

It is the opinion of the Expert Panel that the health professional team members should consider documenting in the patient's record the key educational points (See table below), patient concerns, and actions the patient agrees to take **(Evidence C)**.

Table. Key Educational Messages: Teach and Reinforce at Every Opportunity
Basic Facts About Asthma
• The contrast between airways of a person who has and a person who does not have asthma; the role of inflammation • What happens to the airways in an asthma attack
Roles of Medications: Understanding the Difference Between:
• Long-term-control medications: prevent symptoms, often by reducing inflammation. Must be taken daily. Do not expect them to give quick relief. • Quick-relief medications: short-acting beta$_2$-agonists relax muscles around the airway and provide prompt relief of symptoms. Do not expect them to provide long-term asthma control. Using quick-relief medication on a daily basis indicates the need for starting or increasing long-term control

Table. Key Educational Messages: Teach and Reinforce at Every Opportunity
medications.
Patient Skills

• Taking medications correctly
  • Inhaler technique (demonstrate to patient and have the patient return the demonstration)
  • Use of devices, such as prescribed valved holding chamber (VHC), spacer, nebulizer
• Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke
• Self-monitoring to:
  • Assess level of asthma control
  • Monitor symptoms and, if prescribed, peak flow
  • Recognize early signs and symptoms of worsening asthma
• Using written asthma action plan to know when and how to:
  • Take daily actions to control asthma
  • Adjust medication in response to signs of worsening asthma
  • Seek medical care as appropriate

Teach Asthma Self-Management

The Expert Panel recommends that:

- Clinicians teach patients and families the basic facts about asthma (especially the role of inflammation), medication skills, and self-monitoring techniques **(Evidence A)**.
- Provide all patients with a written asthma action plan that includes daily management and how to recognize and handle worsening asthma. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma **(Evidence B)**.
- Clinicians teach patients environmental control measures (See NGC summary of the NAEPP guideline Control of Environmental Factors and Comorbid Conditions That Affect Asthma for evidence ranking on different control measures).

Jointly Develop Treatment Goals

The Expert Panel recommends that clinicians determine the patient's personal treatment goals and preferences for treatment; review the general goals of asthma treatment; and agree on the goals of treatments **(Evidence B)**.

- Determine the patient's personal treatment goals and preferences for treatment.
- Share the general goals of asthma treatment with the patient and family.
- Agree on the goals of treatment.
- Provide a written asthma action plan that reflects the agreed upon goals for treatment. See discussion in the original guideline document: "The Role of Written Asthma Action Plans for Patients Who Have Asthma."

Assess and Encourage Adherence to Recommended Therapy

The Expert Panel recommends that clinicians assess and encourage adherence during all asthma visits **(Evidence C)**.

Tailor Education Needs to the Individual Patient

The Expert Panel recommends that:

- Asthma education interventions be tailored as much as possible to an individual's underlying knowledge and beliefs about the disease **(Evidence C)**.
- Health care professionals who develop asthma education programs consider the needs of patients who have limited literacy **(Evidence C)**.
- Clinicians consider assessing cultural or ethnic beliefs or practices that may influence self-management activities, and modify educational approaches as needed **(Evidence C)**.

Maintain the Partnership

The Expert Panel recommends that clinicians demonstrate, review, evaluate, and correct inhaler technique and, if appropriate, the use of a VHC or spacer at each visit, because these skills can deteriorate rapidly **(Evidence C)**.

The Expert Panel recommends that clinicians continue to promote open communication with the patient and family by addressing, as much as possible, the following elements in each followup visit (**Evidence B** unless otherwise noted) (See also figure 3–13 in the original guideline document):

- Continue asking patients early *in each visit* what concerns they have about their asthma and what they especially want addressed during the visit.
- Review the short-term goals agreed on in the initial visit.
- Review the written asthma action plan and the steps the patient is to take. Adjust the plan as needed.
- Either encourage parents to take a copy of the child's written asthma action plan to the child's school or childcare setting, or obtain parental permission and send a copy to the school nurse or designee **(Evidence C)** (See figures 3–16a, b in the original guideline document).
- Continue teaching and reinforcing key educational messages (See table above, "Key Educational Messages: Teach and Reinforce at Every Opportunity").
- Give patients simple, brief, written materials that reinforce the actions recommended and skills taught (Gibson et al., 2000). (See "Asthma Education Resources" in the original guideline document for a list of organizations that distribute patient education materials.)

Provider Education

Methods of Improving Clinician Behaviors

The Expert Panel recommends the use of multifaceted, clinician education programs that reinforce guidelines-based asthma care and are based on interactive learning strategies **(Evidence B)**.

Communication Techniques

The Expert Panel recommends that:

- Clinicians consider participating in programs designed to enhance their skills in communicating with patients **(Evidence B)**.
- Clinicians consider documenting communication and negotiated agreements between patients and clinicians during medical encounters and that the level of asthma control be documented in the medical record of a patient at every visit to facilitate communication with patients during subsequent visits **(Evidence C)**.
- Communication skills-building programs include strategies to increase competence in caring for multicultural populations **(Evidence D)**.

Methods for Improving System Supports

Clinical Pathways

The Expert Panel recommends that clinical pathways be considered for the inpatient setting for patients who are admitted to hospital with asthma exacerbations **(Evidence B)**.

Clinical Decision Supports

The Expert Panel recommends that:

- Prompts encouraging guideline-based care be integrated into system-based interventions focused on improving the overall quality of care rather than used as a single intervention strategy **(Evidence B)**.
- System-based interventions that address multiple dimensions of the organization and delivery of care and clinical decision support be considered to improve and maintain quality of care for patients who have asthma **(Evidence B and C)**.

Definitions:

Levels of Evidence

The system* used to describe the level of evidence is as follows:

Evidence Category A: Randomized controlled trials (RCTs), rich body of data.
Evidence is from end points of well-designed RCTs that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants.

Evidence Category B: RCTs, limited body of data.
Evidence is from end points of intervention studies that include only a limited number of patients, post hoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, category B pertains when few randomized trials exist; they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent.

Evidence Category C: Nonrandomized trials and observational studies.
Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies.

Evidence Category D: Panel consensus judgment.
This category is used only in cases where the provision of some guidance was deemed valuable, but the clinical literature addressing the subject was insufficient to justify placement in one of the other categories. The Panel consensus is based on clinical experience or knowledge that does not meet the criteria for categories A through C.

*Source: Jadad AR, Moher M, Browman GP, Booker L, Sigouin C, Fuentes M, Stevens R. Systematic reviews and meta-analyses on treatment of asthma: critical evaluation. *BMJ* 2000;320(7234):537-40.

Strength of Recommendations

In addition to specifying the level of evidence supporting a recommendation, the Expert Panel agreed to indicate the strength of the recommendation. When a certain clinical practice "is recommended," this indicates a strong recommendation by the panel. When a certain clinical practice "should, or may, be considered," this indicates that the recommendation is less strong.

This distinction is an effort to address nuances of using evidence ranking systems. For example, a recommendation for which clinical RCT data are not available (e.g., conducting a medical history for symptoms suggestive of asthma) may still be strongly supported by the Panel. Furthermore, the range of evidence that qualifies a definition of "B" or "C" is wide, and the Expert Panel considered this range and the potential implications of a recommendation as they decided how strongly the recommendation should be presented.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

The ultimate goal of both expert care and patient self-management is to reduce the impact of asthma on related morbidity, functional ability, and quality of life. The benefits of educating people who have asthma in the self-management skills of self-assessment, use of medications, and actions to prevent or control exacerbations, include reduction in urgent care visits and hospitalizations, reduction of asthma-related health care costs, and improvement in health status. Other benefits of value from self-management education are reduction in symptoms, less limitation of activity, improvement in quality of life and perceived control of asthma, and improved medication adherence. Cost-analysis studies have shown that asthma education can be delivered in a cost-effective manner and that morbidity is reduced as a result, especially in high-risk subjects.

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

These guidelines are intended to inform, not replace, clinical judgment. Of course, the clinician and patient need to develop individual treatment plans that are tailored to the specific needs and circumstances of the patient.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Foreign Language Translations
Patient Resources
Quick Reference Guides/Physician Guides
Resources

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Education for a partnership in asthma care. In: National Asthma Education and Prevention Program (NAEPP). Expert panel report 3: guidelines for the diagnosis and management of asthma. Bethesda (MD): National Heart, Lung, and Blood Institute; 2007 Aug. p. 93-164. [239 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1997 (revised 2007 Aug)

GUIDELINE DEVELOPER(S)

National Asthma Education and Prevention Program - Federal Government Agency [U.S.]
National Heart, Lung, and Blood Institute (U.S.) - Federal Government Agency [U.S.]

GUIDELINE DEVELOPER COMMENT

The National Asthma Education and Prevention Program Science Base Committee is a multidisciplinary group of clinicians and scientists with expertise in asthma management. The group includes health professionals in the areas of general medicine, family practice, pediatrics, emergency and critical care, allergy, pulmonary medicine, pharmacy, and health education.

SOURCE(S) OF FUNDING

The development of this report was entirely funded by the National Heart, Lung, and Blood Institute, National Institutes of Health.

GUIDELINE COMMITTEE

National Asthma Education and Prevention Program (NAEPP) Coordinating Committee
Third Expert Panel on the Diagnosis and Management of Asthma

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Third Expert Panel on the Diagnosis and Management of Asthma Members: William W. Busse, MD (Chair), University of Wisconsin Medical School, Madison, WI; Homer A. Boushey, MD, University of California at San Francisco, San Francisco, CA; Carlos A. Camargo, MD, DrPH, Massachusetts General Hospital, Boston, MA; David Evans, PhD, AE-C., Columbia University, New York, NY; Michael B. Foggs, MD, Advocate Health Care, Chicago, IL; Susan Janson, DNSc, RN, University of California, San Francisco, California; H. William Kelly, PharmD, University of New Mexico Health Sciences Center, Albuquerque, NM; Robert F. Lemanske, MD, University of Wisconsin Hospital and Clinics, Madison, WI; Fernando D. Martinez, MD, University of Arizona Medical Center, Tucson, AZ; Robert J. Meyer, MD, U.S. Food and Drug Administration, Rockville, MD; Harold S. Nelson, MD, National Jewish Medical and Research Center, Denver, CO; Thomas A.E. Platts-Mills, MD, PhD, University of Virginia School of Medicine, Charlottesville, VA; Michael Schatz, MD, MS, Kaiser-Permanente Medical Center, San Diego, CA; Gail Shapiro, MD (deceased), Northwest Asthma and Allergy Center, Seattle, WA; Stuart Stoloff, MD, University of Nevada School of Medicine, Carson City, NV; Stanley Szefler, MD, National Jewish Medical and Research Center, Denver, CO; Scott T. Weiss, MD, MS, Brigham and Women's Hospital, Boston, MA; Barbara P. Yawn, MD, MSc, Olmstead Medical Center, Rochester, MN

See the original guideline document for members of the National Asthma Education and Prevention Program (NAEPP) Coordinating Committee, a list of consultant reviewers, and members of the National Heart, Lung, and Blood Institute and American Institutes for Research staffs.

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Development of the resource document and the guidelines report was funded by the National Heart, Lung, and Blood Institute (NHLBI), and National Institutes of Health (NIH). Expert Panel members completed financial disclosure forms, and the Expert Panel members disclosed relevant financial interests to each other prior to their discussions. Expert Panel members participated as volunteers and were compensated only for travel expenses related to the Expert Panel meetings. Financial disclosure information covering the 3-year period during which the guidelines were developed is provided for each Panel member below.

Dr. Busse has served on the Speakers' Bureaus of GlaxoSmithKline, Merck, Novartis, and Pfizer; and on the Advisory Boards of Altana, Centocor, Dynavax, Genentech/Novartis, GlaxoSmithKline, Isis, Merck, Pfizer, Schering, and Wyeth. He has received funding/grant support for research projects from Astellas, AstraZeneca, Centocor, Dynavax, GlaxoSmithKline, Novartis, and Wyeth. Dr. Busse also has research support from the NIH.

Dr. Boushey has served as a consultant for Altana, Protein Design Lab, and Sumitomo. He has received honoraria from (Boehringer-Ingelheim, Genentech, Merck, Novartis, and Sanofi-Aventis, and funding/grant support for research projects from the NIH.

Dr. Camargo has served on the Speakers' Bureaus of AstraZeneca, GlaxoSmithKline, Merck, and Schering-Plough; and as a consultant for AstraZeneca, Critical Therapeutics, Dey Laboratories, GlaxoSmithKline, MedImmune, Merck, Norvartis, Praxair, Respironics, Schering-Plough, Sepracor, and TEVA. He has received funding/grant support for research projects from a variety of Government agencies and not-for-profit foundations, as well as AstraZeneca, Dey Laboratories, GlaxoSmithKline, MedImmune, Merck, Novartis, and Respironics.

Dr. Evans has received funding/grant support for research projects from the NHLBI.

Dr. Foggs has served on the Speakers' Bureaus of GlaxoSmithKline, Merck, Pfizer, Sepracor, and UCB Pharma; on the Advisory Boards of Alcon, Altana, AstraZeneca, Critical Therapeutics,Genentech, GlaxoSmithKline, and IVAX; and as consultant for Merck and Sepracor. He has received funding/grant support for research projects from GlaxoSmithKline.

Dr. Janson has served on the Advisory Board of Altana, and as a consultant for Merck. She has received funding/grant support for research projects from the NHLBI.

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Dr. Lemanske has served on the Speakers' Bureaus of GlaxoSmithKline and Merck, and as a consultant for AstraZeneca, Aventis, GlaxoSmithKline, Merck, and Novartis. He has received honoraria from Altana, and funding/grant support for research projects from the NHLBI and NIAID.

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Dr. Meyer has no relevant financial interests.

Dr. Nelson has served on the Speakers' Bureaus of AstraZeneca, GlaxoSmithKline, Pfizer, and Schering-Plough; and as a consultant for Abbott Laboratories, Air Pharma, Altana Pharma US, Astellas, AstraZeneca, Curalogic, Dey Laboratories, Dynavax Technologies, Genentech/Novartis, GlaxoSmithKline, Inflazyme Pharmaceuticals, MediciNova, Protein Design Laboratories, Sanofi-Aventis, Schering-Plough, and Wyeth Pharmaceuticals. He has received funding/grant support for research projects from Altana, Astellas, AstraZeneca, Behringer, Critical Therapeutics, Dey Laboratories, Epigenesis, Genentech, GlaxoSmithKline, Hoffman LaRoche, IVAX, Medicinova, Novartis, Sanofi-Aventis, Schering-Plough, Sepracor, TEVA, and Wyeth.

Dr. Platts-Mills has served on the Advisory Committee of Indoor Biotechnologies. He has received funding/grant support for a research project from Pharmacia Diagnostics.

Dr. Schatz has served on the Speakers' Bureaus of AstraZeneca, Genentech, GlaxoSmithKline, and Merck; and as a consultant for GlaxoSmithKline on an unbranded asthma initiative. He has received honoraria from AstraZeneca, Genentech, GlaxoSmithKline and Merck. He has received funding/grant support for research projects from GlaxoSmithKline and Merck and Sanofi-Adventis.

Dr. Shapiro (deceased) served on the Speakers' Bureaus of AstraZeneca, Genentech, GlaxoSmithKline, IVAX Laboratories, Key Pharmaceuticals, Merck, Pfizer Pharmaceuticals, Schering Corporation, UCB Pharma, and 3M; and as a consultant for Altana, AstraZeneca, Dey Laboratories, Genentech/Novartis, GlaxoSmithKline, ICOS, IVAX Laboratories, Merck, Sanofi-Aventis, and Sepracor. She received funding/grant support for research projects from Abbott, AstraZeneca, Boehringer Ingelheim, Bristol-Myers-Squibb, Dey Laboratories, Fujisawa Pharmaceuticals, Genentech, GlaxoSmithKline, Immunex, Key, Lederle, Lilly Research, MedPointe Pharmaceuticals, Medtronic Emergency Response Systems, Merck, Novartis, Pfizer, Pharmaxis, Purdue Frederick, Sanofi-Aventis, Schering, Sepracor, 3M Pharmaceuticals, UCB Pharma, and Upjohn Laboratories.

Dr. Stoloff has served on the Speakers' Bureaus of Alcon, Altana, AstraZeneca, Genentech, GlaxoSmithKline, Novartis, Pfizer, Sanofi-Aventis, and Schering; and as a consultant for Alcon, Altana, AstraZeneca, Dey, Genentech, GlaxoSmithKline, Merck, Novartis, Pfizer, Sanofi-Aventis, and Schering.

Dr. Szefler has served on the Advisory Boards of Altana, AstraZeneca, Genentech, GlaxoSmithKline, Merck, Novartis, and Sanofi-Aventis; and as a consultant for Altana, AstraZeneca, Genentech, GlaxoSmithKline, Merck, Novartis, and Sanofi-Aventis. He has received funding/grant support for a research project from Ross.

Dr. Weiss has served on the Advisory Board of Genentech, and as a consultant for Genentech and GlaxoSmithKline. He has received funding/grant support for research projects from GlaxoSmithKline.

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Financial disclosure information covering a 12 month period prior to the review of the guidelines is provided in the original guideline document for each consultant reviewer.

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: National Asthma Education and Prevention Program Expert Panel Report: guidelines for the diagnosis and management of asthma update on selected topics-2002. J Allergy Clin Immunol 2002 Nov;110(5 pt 2):S141-219.

GUIDELINE AVAILABILITY

Electronic copies: Available from the National Heart, Lung, and Blood Institute Web site.

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Guidelines for the diagnosis and management of asthma. Summary report 2007. Bethesda (MD): National Heart, Lung, and Blood Institute; 2007. Available from the National Heart, Lung, and Blood Institute Web site.
- Overall methods used to develop this report. Electronic copies: Available from the National Heart, Lung, and Blood Institute Web site.
- Search strategies. Electronic copies: Available from the National Heart, Lung, and Blood Institute Web site.
- Evidence tables. Electronic copies: Available from the National Heart, Lung, and Blood Institute Web site.
- Lung diseases information. Information for health professionals. Electronic copies: Available from the National Heart, Lung, and Blood Institute Web site.

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

Additional tools, including sample action plans can be found in the original guideline document.

PATIENT RESOURCES

The following is available:

- Lung diseases information. Information for patients and the public.

Electronic copies: Available from the National Heart, Lung and Blood Institute Web site.

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC STATUS

This summary was completed by ECRI on January 5, 1999. The information was verified by the guideline developer on April 30, 1999. This summary was updated by ECRI on January 31, 2003. This information was not verified by the guideline developer. This summary was updated by ECRI on December 5, 2005 following the U.S. Food and Drug Administration (FDA) advisory on long-acting beta2-adrenergic agonists (LABA). This NGC summary was updated by ECRI Institute on January 11, 2008.

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